Upper Eastern Shore

SAV Distribution

The well-defined linkage between water quality and submerged aquatic vegetation (SAV) distribution and abundance make SAV communities good barometers of the health of estuarine ecosystems (Dennison *et al.*, 1993). SAV is important not only as an indicator of water quality, but it is also a critical nursery habitat for many estuarine species. Blue crab post-larvae are 30 times more abundant in SAV beds than adjacent unvegetated areas (Orth, 1992). Similarly, several species of waterfowl are dependant on SAV as food when they over-winter in the Chesapeake region (Perry and Deller, 1995).

SAV distribution is determined through the compilation of aerial photography directed by the Virginia Institute of Marine Science. Reports detailing methodology and annual SAV coverage are available at www.vims.edu/bio/sav. Details on species of SAV discussed in this report can be found at www.dnr.maryland.gov/bay/sav/key.

Habitat Status

The Chesapeake Bay Program has developed new criteria for determining SAV habitat suitability of an area based on water quality. The "Percent Light at Leaf" habitat requirement assesses the amount of available light reaching the leaf surface of SAV after being attenuated in the water column and by epiphytic growth on the leaves themselves (Kemp *et al.,* 2004). The document describing this new model is found on the Chesapeake Bay Program website (www.chesapeakebay.net/pubs/sav/index.html). The older "Habitat Requirements" of five water quality parameters are still used for diagnostic purposes (Dennison *et al.*, 1993).

Northeast River

The tidal fresh Northeast River has had only small amounts since 1984 (**figure 1a**). However, SAV coverage in 2004 (84 acres) neared the revised goal of 88 acres. After several years of no SAV being mapped, 1994 had 20 acres, and since then, the SAV coverage has been highly variable, fluctuating between 12 and 84 acres (95% of the goal occurring in 2004). 46 acres were identified in 2003. When present, beds are usually located in the vicinity of Carpenter Point and Cara Cove. Ground-truthing by citizens and staff from Harford County College have found, in order of frequency, milfoil, wild celery, coontail, hydrilla, water stargrass, naiads and horned pondweed. Water quality data from the station located near Charlestown indicate that phosphorous levels meet and suspended solids are borderline to the SAV habitat requirements (**figure 2a**). Light attenuation, percent light at leaf and algae level fail to meet the SAV habitat requirements. Nitrogen is not applicable.

Back Creek

In 2004, Back Creek, at the mouth of the Chesapeake & Delaware Canal, had SAV identified (8.1 acres) for the only time since 1978 (**figure 1a**). There is no revised goal nor ground-truthing information for this segment. Water quality data from the station located near Chesapeake City indicate that only algae levels meet the SAV habitat requirements (**figure 2a**) all other parameters fail the requirement. Nitrogen is not applicable in this low salinity environment.

Elk River

The low salinity (oligohaline) Elk River has had highly variable SAV coverage since 1989 (**figure 1a**), though there has been an increasing trend in SAV abundance since 1996 (which had 108 acres). In 2001, the increasing trend continued, with 2,035 acres of SAV being identified, which is the second year in a row that the revised goal of 1,648 acres has been exceeded in the aerial survey. In 2002 and 2003, coverage receded to 435 and 346 acres, respectively. In 2004, SAV coverage again exceeded the goal, with 1,912 acres being mapped. SAV beds fringed much of the shoreline of the Elk River. Ground-truthing by citizens and staff from Harford Community College and EPA have found, in order of frequency of occurrence, milfoil, wild celery, sago pondweed, coontail, hydrilla, curly pondweed and water stargrass. Water quality data from the monitoring stations located near Oldfield Point (**figure 2a**) indicate that concentrations of algae pass and phosphorous are borderline to the SAV habitat requirements, while light attenuation, percent light at leaf and levels of suspended solids fail. Nitrogen level is not applicable in this low salinity area.

Bohemia River

In the low salinity (oligohaline) Bohemia River, there has been a relatively steady increase in SAV coverage from a low of less than an acre in 1993. There was an astounding increase in SAV in 2004 to 729 acres, or 750% of the revised goal of 97 acres. SAV fringes most of the shoreline from the Route 213 bridge to the mouth of the river. The largest areas of SAV occurred from Battery Point (south shore) and Rich Point (north shore) to the Route 213 bridge. Limited ground-truthing by citizens and staff from Harford Community College have found in order of frequency; milfoil, wild celery, hydrilla, coontail and curly pondweed. Water quality data from the station near Old Hack Point indicate that phosphorous concentrations pass and suspended solids concentration are borderline to the SAV habitat requirements, while light attenuation, percent light at leaf, and algae concentrations fail (**figure 2a**). Nitrogen is not applicable.

Sassafras River

The low salinity (oligohaline) Sassafras River has had highly variable SAV coverage since 1984, with a low of 34 acres in 1992 to 1,169 acres in 2001 (153% of the revised goal of 764 acres) (**figure 1b**). SAV declined to 830 acres in 2002 and 370 acres in

2003. SAV rebounded in 2004, 1,271 acres, the highest ever recorded by VIMS survey and 166% of the goal. SAV beds fringe much of the river, from the mouth to Shellcross Neck. Ground-truthing by staff from Harford Community College has found, in order of frequency observed, milfoil, wild celery, coontail, hydrilla, sago pondweed, naiads and water stargrass. The Department of Natural Resources has been removing the invasive floating plant, water chestnut, from several creeks in the Sassafras area. Water chestnut is an exotic species that can out-compete native submerged species. The spiked seeds of this plant also pose a hazard to people swimming or water skiing in the area. Water quality data from the station located at the Route 213 bridge near Georgetown indicate that phosphorous levels meet the SAV habitat requirements (**figure 2b**), while concentrations of suspended solids and algae, percent light at leaf and light attenuation fail. Nitrogen is not applicable in this low salinity river.

Upper Chester River

In the tidal fresh Chester River, SAV has never been mapped, while the oligohaline (low salinity) portion had SAV mapped for the first time in 2004 (4.3 acres in Shippen Creek) (**figure 1b**). There is no Tier I goal, and no ground-truthing has occurred. There is no water quality data for the low salinity (oligohaline) region. Data for the tidal fresh area, obtained from the station located near Crumpton indicate that only algae levels pass the SAV habitat requirements (**figure 2b**), while the other four (phosphorous concentrations, percent light at leaf, light attenuation and suspended solids) fail. Nitrogen is not applicable in this low salinity river.

Lower Chester River

In the moderate salinity (mesohaline) portion of Chester River, SAV coverage has been highly variable since 1984 (**figure 1b**), ranging from a low of 80 acres in 1990 to a high of 1,181 acres in 1998. SAV coverage declined in 1999 and 2000. These declines were due to high summer salinities resulting from drought conditions. These unusually high salinities produced conditions beyond the local species salinity tolerances. In 2000, large, dense algal blooms greatly reduced available light needed by SAV during the critical spring growing period. In 2004, SAV recovered somewhat, reaching 731 acres or about 27% of the revised goal of 2724 acres. SAV is located near Swan and Tavern Creeks and near Eastern Neck Island on the Kent County side, and in fringing beds from Queenstown Creek to Macum Creek on the Queen Anne's county side. Ground-truthing by citizens (and the Chester River Association) and staff from Maryland DNR, Patuxent River Wildlife Center, U. S. Fish and Wildlife Service and Environmental Protection Agency has found, in order of most frequently reported, redhead grass, milfoil, elodea, widgeon grass, sago pondweed, horned pondweed, wild celery and naiads. Water quality monitoring data from the station located between the southern tip of Eastern Neck Island and Kent Narrows indicate that light attenuation, suspended solids and phosphorous pass the habitat requirements, while percent light at leaf and level of algae are borderline and nitrogen concentrations fail (**figure 2b**). Test plots of wild celery, sago pondweed and redhead grass where planted on the Corsica River in late June, 2004, and survived through the summer. In 2005, small (~100 square meter)

plots were seeded with wild celery seeds and smaller 1 meter plots were planted with wild celery, sago pondweed and redhead grass tubers. These failed to thrive, apparently from large algae blooms that occurred throughout the summer in Corsica River.

Eastern Bay

In the moderate salinity (mesohaline) Eastern Bay, SAV coverage has been increasing since 1991 (**figure 1b**), ranging from a low of 168 acres in 1991 to a high of 4,955 acres in 1999, which represented 81% of the Tier I goal (6108). Due to large, dense algal blooms reducing the amount of available light in 2000, SAV coverage declined dramatically. Fortunately, 2001 SAV coverage rebounded, reaching 2,887 acres (47% of Tier I), though subsequent years showed declines each year, reaching 1,039 acres in 2004. Typically there are large beds on most shorelines around Eastern Bay and Miles River and smaller more scattered beds in the Wye River. Ground-truthing by citizens and staff from Maryland DNR, Patuxent River Wildlife Center, U. S. Fish and Wildlife Service, U. S. Geological Survey, National Aquarium in Baltimore, National Oceanic and Atmospheric Administration and Virginia Institute of Marine Science has found, in order of most frequently reported, widgeon grass, horned pondweed, redhead grass, milfoil, sago pondweed, elodea, eelgrass and naiads. Water quality monitoring data from the station located between Parsons Island and Tilghman Point indicate that percent light at leaf and suspended solids meet the SAV habitat requirements, light attenuation and levels of nitrogen and phosphorous are borderline and concentration of algae fails (**figure 2b**). Eelgrass test plots were done in 2003 at Hambleton Point (Miles River), and survived until spring 2004. In fall of 2004, three additional eelgrass test plots were done at Hambleton Point, near Porter Creek and Tilghman Point.

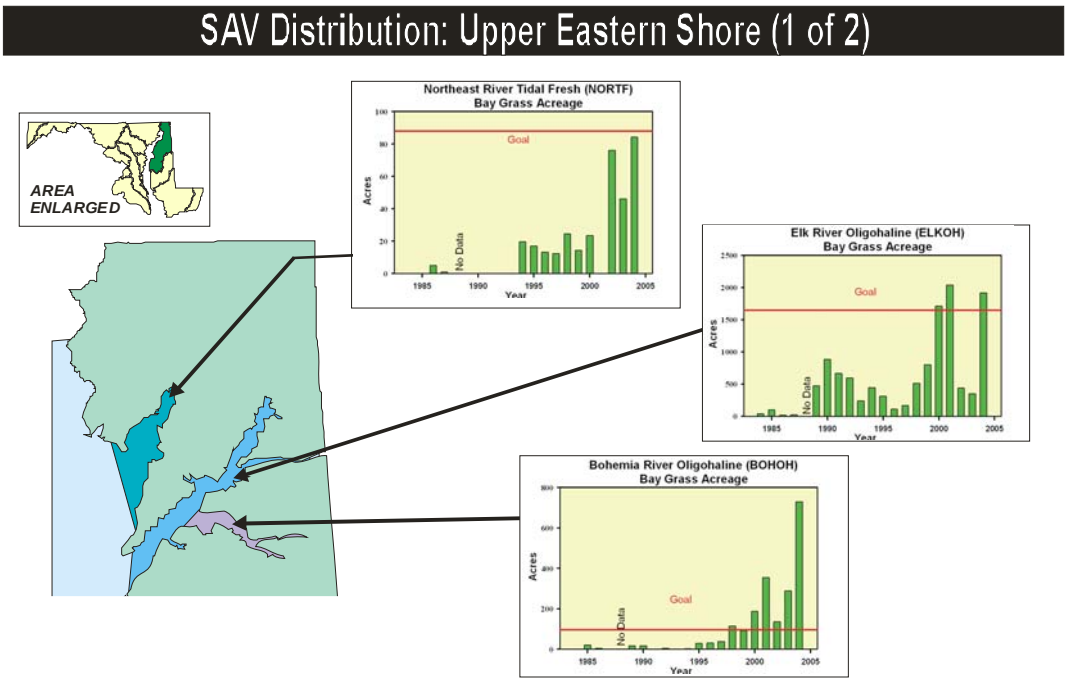

Figure 1a: SAV coverage on the Upper Eastern Shore, 1984 to 2004

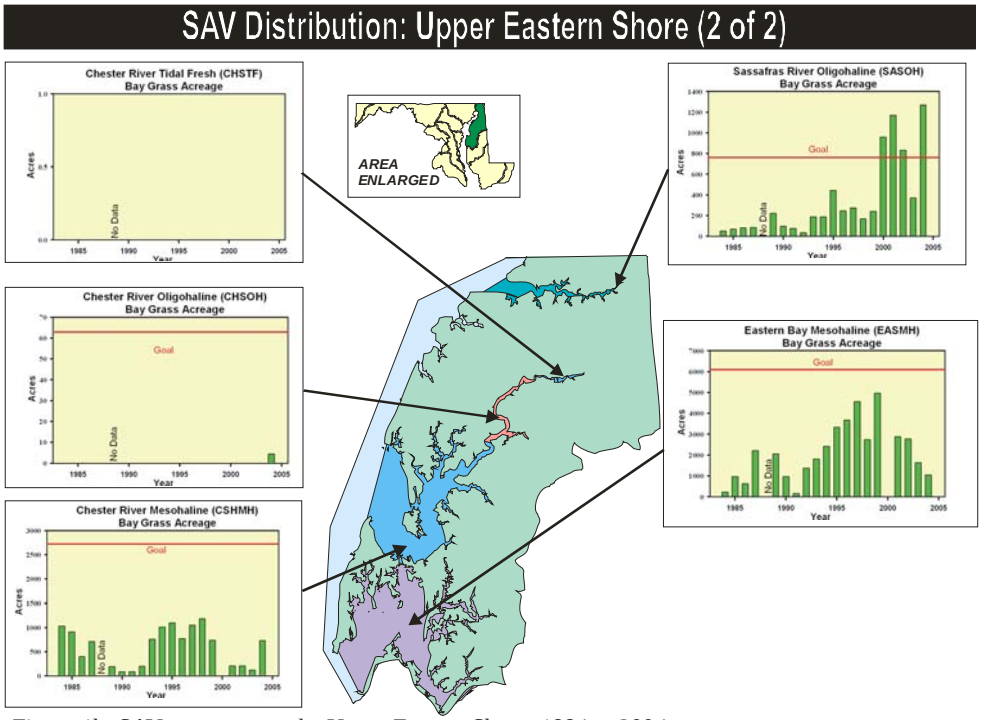

Figure 1b: SAV coverage on the Upper Eastern Shore, 1984 to 2004

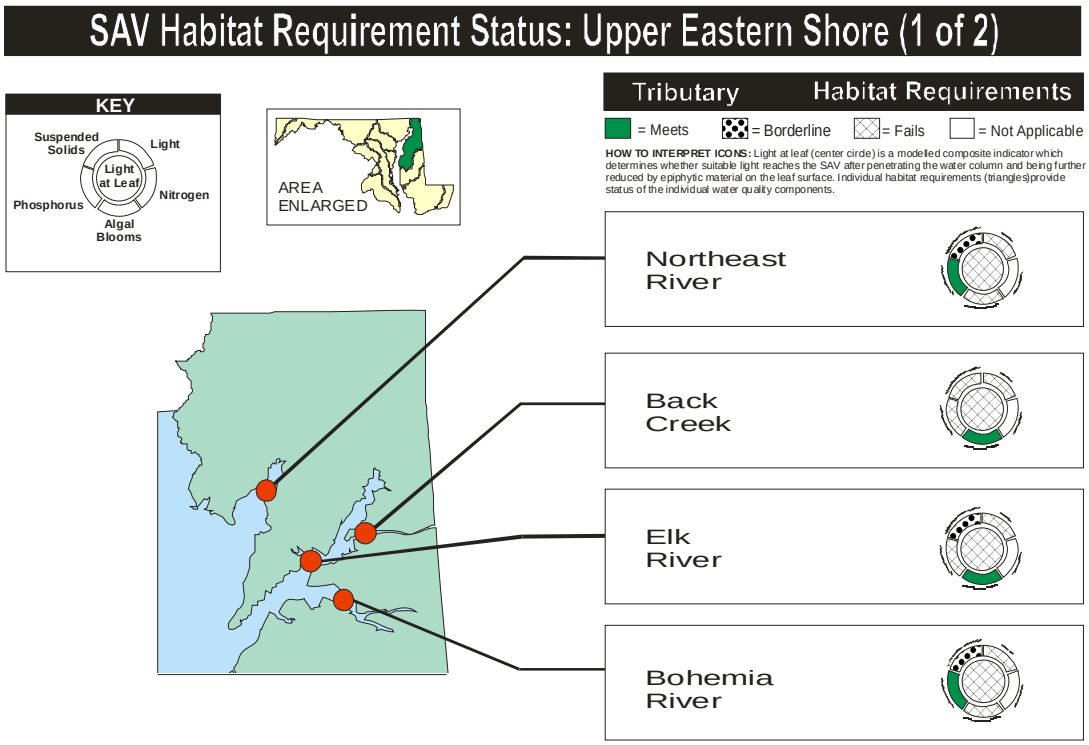

Figure 2a: SAV habitat requirement attainment on the Upper Eastern Shore

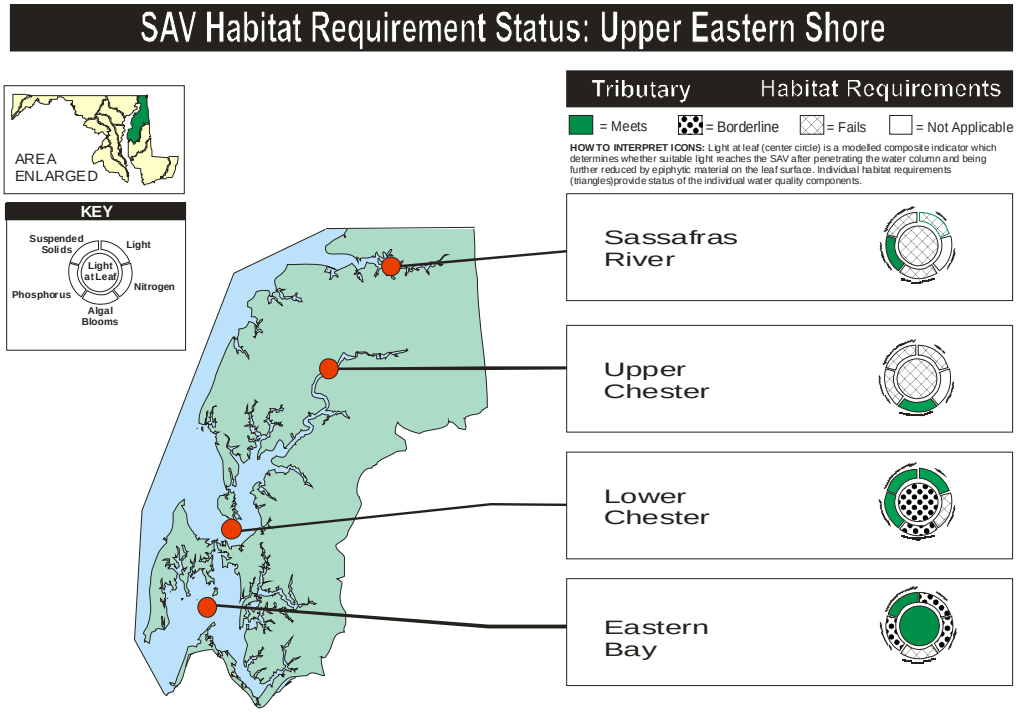

Figure 2b: SAV habitat requirement attainment on the Upper Eastern Shore

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